

NIMA

JULY/AUGUST 2003

PATHFINDER

Know the Earth ... Show the Way

Commercial Imagery's Expanding Role

 Tomb of the
Unknown Soldier (Iraq)

 Burning
Oil-Filled
Trench

PATHFINDER

JULY/AUGUST 2003

NATIONAL IMAGERY AND MAPPING AGENCY



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Oil-filled trenches in Baghdad, next to Iraq's Tomb of the Unknown Soldier, have been set on fire, as shown in this satellite image taken April 1 by DigitalGlobe Inc. U.S. officials used images like this as proof that American bombing did not cause the fires. Operation Iraqi Freedom demonstrated the growing significance of commercial imagery in NIMA's suite of sources for producing geospatial intelligence. NIMA's NextView contract will provide structure for expanded support while implementing the president's new policy on commercial imagery. See page 8.

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On My Mind ...

Commercial Imagery and NIMA

The White House recently released the National Security Presidential Directive *U.S. Commercial Remote Sensing Space Policy*. The policy delivered unequivocal guidance for using satellite commercial imagery and promoting the valued growth of that industry. The federal government will rely, to the maximum extent possible, on that imagery to satisfy the imagery and geospatial needs of military and national intelligence, foreign policy, homeland security, environmental response and other civil domestic use. NIMA's commercial imagery program already reflects compliance with the new policy, evidenced by the complementary role that commercial satellite imagery played in Operation Iraqi Freedom. NIMA contributed heavily in the formulation of this new policy.

Right now, the commercial remote-sensing industry is preparing proposals in response to the NextView solicitation, released in mid-June. This solicitation, advancing beyond our current ClearView agreements, seeks to assure NIMA's opportunity for acceptably priced purchases of imagery and imagery service, reflecting a more advanced commercial capability and increased capacity, promised by the next generation of commercial satellites. In addition, NIMA is seeking priority access privileges; more efficient and effective tasking, collection and dissemination processes; and broad licensing terms.

Why would the government look to industry and commodity purchases? Government has traditionally and exclusively dominated this domain of high-resolution space-based reconnaissance. In his remarks, prepared for commercial imagery providers, NIMA Director retired Air Force Lt. Gen. James R. Clapper Jr. quoted a prominent economist of the last century:

"The important thing for government is not to do things that individuals are already doing and to do them a little better or a little worse, but to do things that at present are not done at all."

For those of us who have been using national systems for some time, we

recognize that the Corona program of the Cold War era was transformational in its delivery of high-resolution space-based imagery, which was skillfully exploited by imagery intelligence and geospatial experts. Corona gave this nation a technologically unchallenged and unquestionably reliable source of imagery intelligence and eliminated risky dependence upon dangerous U2 aerial missions. No one was developing this needed capability as a commercial venture; it was left to the government to fund the needed research, the basic engineering, the perilous first launches and the supporting infrastructure. As history evidenced, the investment was timely. In May 1960, the downing of a U2 over the former Soviet Union caused a cessation of this information-gathering program. Had Corona not been available, such termination would have opened a gap in critical imagery collection, nearly blinding the U.S. insight about Soviet strategic capabilities.

NIMA's maturing partnership with the U.S. commercial satellite imagery industry should be comparably transformational. A strong next generation industry, reinforced by a NextView contract, enables U.S. industry to play a dominant role in the international marketplace and encourages the U.S.



industry to continuously improve its technology for both high quality imagery as well as superb imagery services. The challenge to industry is formidable. Our commercial partners will have far less time to build these next satellites than the government had to develop Corona.

The challenge to NIMA, meeting its geospatial intelligence mission in support of national security objectives, is equally daunting. The world we measure and the events we monitor demand dynamic reporting. The customers we support, as well as the co-producers with whom we inter-operate and the industry with whom we partner, require more timely and better source information and value-adding knowledge to address the critical intelligence issues of each day or, even, each hour. Commercial imagery availability must be assured as yet another reliable source for the military and national needs. The expected outcome of NextView is that assurance.

A handwritten signature in dark ink, reading "Roberta E. Lenczowski".

ROBERTA E. LENCZOWSKI
Technical Executive

Building GeoSpatial Information Capacity for the Nation:

The Emergency Management Business Case

By Susan Kalweit

Are you ready? This question, unfortunately, is all too real a concern. In these times of uncertainty, we face not only threats of disaster from Mother Nature, but also from an adversary who desires to strike at the heart of our daily lives and fundamentally at our way of life. We must be ready!

The Department of Homeland Security/Federal Emergency Management Agency (DHS/FEMA) emphasizes that there are simple things we can do to be ready. Have a kit. Make a plan. Stay informed. In addition, there are ways we can apply technology to save lives and protect property. Geographic information system (GIS) technologies integrated with disaster planning, response and recovery systems are a key underpinning to these planning and decision-support systems. It is with this understanding—that geospatial information technologies are essential to the decision-making capabilities and actions of emergency managers, planners and responders—that DHS/FEMA is leading the effort to establish geospatial preparedness as a priority for our nation.

Per the U.S. Geological Survey (USGS) vision of The National Map (a

consistent framework for geographic knowledge needed by the nation) as evidenced throughout government, geospatial information technologies are not only applicable but also critical to a wide variety of business areas in the public and private sectors. All of these business areas depend upon having the best available data to use. However, in only a few areas of our country are the best available data and the associated GIS technology truly the best. That is, (1) the data holdings are of high quality, recent currency, well-documented according to federal standards and geographically-referenced to national standards, and (2) the geospatial systems implement commercially-accepted, open interfaces and standards to facilitate sharing and interoperability.

These holdings and their stewards are models for what our nation needs to build and maintain the geospatial capacity critical to saving lives and protecting property. This capacity is the key to a spatially enabled national emergency management infrastructure whereby the best data is available for those who need it, when they need it, where they need it and how they need it. That is geospatial preparedness!

What Will It Take?

What will it take to establish a robust and reliable capacity for national geospatial preparedness? This is the key question that the Interagency Geospatial Preparedness Team (IGPT) is tackling. DHS/FEMA sponsors the IGPT, which currently consists of geospatial experts from NIMA, the USGS, the U.S. Department of Agriculture Forest Service, the National Oceanic and Atmospheric Administration and FEMA working inside the emergency manage-

ment community to assess their geospatial information technology needs and capabilities.

The IGPT is working in close partnership with Geospatial One-Stop (the Administration's E-government initiative) and the Federal Geographic Data Committee; DHS Office of the Chief Information Officer; National States Geographic Information Council and Spatial Technologies Industry Association (STIA) to leverage partnerships, knowledge and expertise in those organizations' activities. The IGPT is open to other mutually beneficial partnerships in the public sector, academia and the private sector. Partnerships—next to technical interoperability—are the most important ingredient for making the best use of limited resources to build geospatial capacity for the nation, and so too for emergency management application.

It is significant that we are not starting from a blank slate. Data being acquired and provided through federal programs such as USGS' The National Map, the FEMA Map Modernization Program, the Census Bureau's Master Address File/Topologically Integrated Geographic Encoding and Referencing Accuracy Improvement Project (MAF/TIGER®) program, the NIMA Homeland Security Infrastructure Program, and state and local initiatives spurred by the National States Geographic Information Council and the Office of Management and Budget Implementation Teams represent some of the ways and means of contributing to establishing geospatial capacity for the nation. Also, initiatives emphasizing government partnerships and interoperability standards at all levels (such as Geospatial One-Stop and the many Federal Geographic Data Committee working groups) contribute to

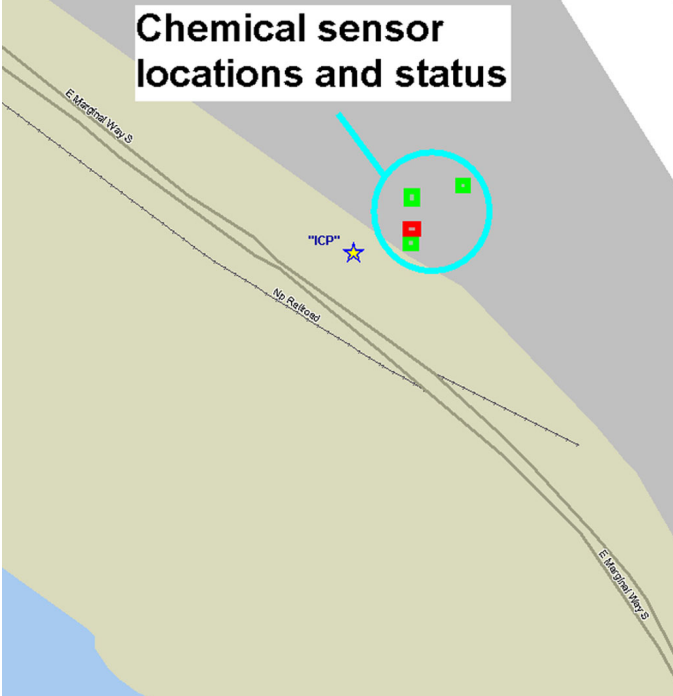
About the Author

A NIMA employee, Susan Kalweit is Chief of the Interagency Geospatial Preparedness Team in the

Emergency Preparedness and Response Directorate of the Federal Emergency Management Agency, Department of Homeland Security.



Chemical sensor locations and status



Map provided by MapQuest.com, Inc. and
© Geographic Data Technology 2002.

establishing the sharing means and relationships critical to geospatial capacity building.

However, efforts in the geospatial community alone aren't enough to sustain a national geospatial capacity. Robust state and local systems that are spatially-enabled for local fire, police, health, first responders and day-to-day operations not only contribute to building our national capacity, but also to sustaining it. The users of spatial data and systems drive the demand for those of us responsible to acquire and maintain the data and systems. In the end, it's the business practitioners and their dependence on spatially enabled business practices that will make our vision a reality. For this reason, the IGPT has focused on understanding the business practices of emergency management and then tying those practices to essential elements of geospatial information.

National Strategy

The national strategy for geospatial preparedness, which the IGPT plans to deliver in the first quarter of calendar year 2004, will address three critical elements: an assessment of needs and current capabilities, a finance strategy for filling the gap between needs and capabilities and sustaining the investment over time, and recommendations

Local responders used technical interfaces provided through an E-government initiative, Geospatial One-Stop, to share imagery, graphics and data on desktop computers. The graphics show U.S. Geological Survey imagery (below) that the responders used to enhance a base map (left) provided by MapQuest Inc. for a tabletop exercise. RAE Systems Inc. provided the overlay of data on chemical sensor locations, shown on both graphics. "This is the interoperability picture we've been wanting for years," participants said, "it will help to save lives, property and businesses." (Data on chemical sensor locations used with permission from RAE Systems, www.raesystems.com.)



**- Congruent zoom in/out
- E-Gov Geospatial One-Stop
approach - high value for
responders**

for possible new policies needed to promote inter-governmental partnering and data sharing. The heart of the strategy is the needs and capabilities assessment. This will be developed with state and local government and academia representatives through facilitated workshops across the country. The workshop participants will represent emergency management and response practitioners, as well as geospatial and information technology practitioners. In addition, the IGPT will work with industry through the Defense and Security Geospatial Initiative of the STIA to characterize the capabilities and

capacity of industry to meet the government's demand and contribute to the national capacity, which supports geospatial preparedness.

It takes a nation to "be ready" to face and overcome all hazards that threaten our lives and way of life. The urgent need to underpin that readiness with geospatial information technologies is what building the capacity to support geospatial preparedness is all about. It is also about all of us contributing to building and sustaining our nation's geospatial capacity through partnerships and through the use of open standards to ensure interoperability.

Marine Safety Team ‘Pushes the Envelope’ For Messages during Operations in Iraq

By Wells Huff

NIMA sent out its first Marine Safety Message with photos attached in early April as a warning to ships operating in the Persian Gulf. Coalition forces had been unable to locate two Iraqi vessels that might have been involved in mining waterways.

“Unidentified service vessel *Al Shorook* and tug *Al Fateh Al Mobeen*, photos attached, are still not located and could be operating anywhere in the Persian Gulf,” the message read. “There is the possibility they will be towing a barge, which can be used to deploy mines.”

Pointing out the importance of the waterways to Iraq’s liberation and recovery, the message went on to urge prompt reporting of sightings of these “or any other vessel operating in a suspicious manner.”

Use of the message with photos of the suspicious ships showed the full capability of the Defense Message

System (DMS), said a senior officer with NIMA’s World Wide Navigational Warning Service.

NIMA officials agreed. “This is a fantastic capability,” said Dave Ridley, deputy chief of the Maritime Safety Information Division. “I am very proud of the fact that we are pushing the envelope and using this system to its fullest.”

In May, the Defense Information Systems Agency (DISA) honored NIMA for its use and support of DMS during a conference it sponsored in Nashville, Tenn. NIMA’s World Wide Navigational Service was selected “DMS Local Control Center of the Year,” while a

senior watch officer was honored as “DMS User of the Year.” DISA cited the entire team for its leadership, professionalism and dedication to improving DMS.

“NIMA is leading the way in making DMS a reality,” said Verlin Hardin, DMS program manager for DISA. A division of DISA, DMS provides multimedia messaging services for some 270 U.S. military installations worldwide.



A photo of the Iraqi tug *Al Fateh Al Mobeen* was one of two attached to message warning ships to beware of Iraqi mines in the Persian Gulf.

Operational Requirements Show the Way

The Defense Department and Intelligence Community recently validated NIMA’s operational requirements for geospatial intelligence, the culmination of a process that began four years ago.

The requirements define NIMA’s ongoing and future acquisition efforts in support of the National System for Geospatial Intelligence (NSGI). Besides core system and functional requirements for NIMA’s portion of the NSGI, the requirements include key performance parameters—those capabilities necessary to meet the NIMA NSGI mission.

Officials in other organizations will refer to NIMA’s operational requirements as they prepare companion sets of requirements to tailor their own NSGI

architecture. They will also use NIMA’s requirements to interface national, theater and tactical systems and activities with NIMA systems, services and activities.

The Joint Requirements Oversight Council, chaired by the Vice Chairman of the Joint Chiefs of Staff, and the Mission Requirements Board of the Director of Central Intelligence have directed NIMA to update the requirements within a year to address the impact of new missions, data providers and media. These include but are not limited to:

- Airborne and commercial imagery ingestion, exploitation, storage and dissemination.

- Advanced Geospatial Intelligence (AGI) missions and technical capabilities.
- Multi-INT integration and fusion.
- The impact of GeoScout recommendations in transforming the NSGI acquisition.

NIMA’s Office of Geospatial Intelligence Management will complete this task, in concert with the rest of the Agency and in partnership with the Geospatial Intelligence Community.

—Office of Geospatial Intelligence Management

NIMA Upgrades GPS Tracking Stations

By Charles Barrett

NIMA's new Global Positioning System (GPS) receivers provide greater security for a critical Agency asset.

The receivers are part of NIMA's Monitor Station Network (MSN)—a worldwide network of unmanned stations that track GPS satellites constantly circling the globe. Controlled in St. Louis, the MSN provides the primary means by which NIMA fulfills its requirement to define and validate the Defense Department's navigation reference frame, World Geodetic System, 1984 (WGS 84). This reference frame is used for all of NIMA's information and products. The MSN also gives the Air Force 100 percent redundant worldwide GPS coverage in near-real time.

What is SAASM?

The new receivers meet the security requirements of the Selective Availability Anti-Spoofing Module (SAASM). The next-generation security architecture, SAASM provides improved protection for cryptography and additional functionality that allows DoD's exclusive use of the GPS.

Selective Availability (SA) was used to degrade military signals for civil use in the 1990s. In May 2000, the SA value was set to zero by presidential directive to provide the civilian community increased positioning accuracy. Although SA capability is still a requirement for GPS receiver design, civilians now have the same GPS positioning accuracy as the military.

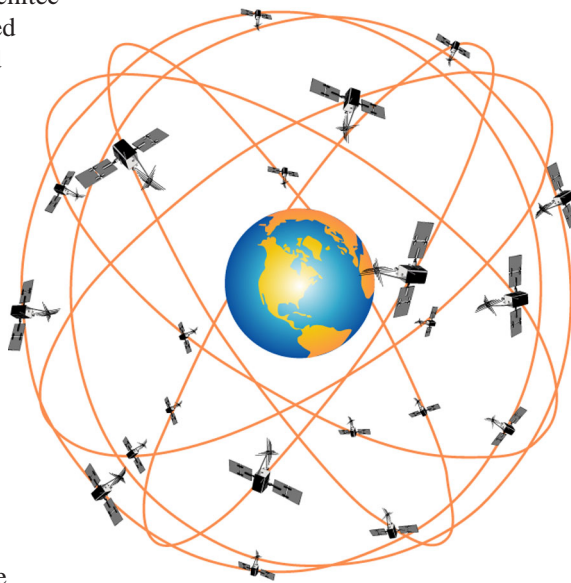
Anti-Spoofing (A-S) functionality protects against the spoofing of GPS signals, should an adversary transmit a valid GPS signal that provides incorrect navigation solutions. A-S

functionality is achieved through encryption of the GPS signal. Once a signal is received, it is validated and decrypted using authorized equipment. This verifies that the signal is a true and accurate GPS signal.

Why SAASM?

NIMA and all of DoD were required to field only SAASM-based GPS user equipment after Oct. 1, 2002 per Chairman Joint Chiefs of Staff (CJCS) Instruction 6140.01. NIMA's acquisition of SAASM receivers is also part of a life-cycle upgrade; the old receivers in the MSN were deployed in 1992 and have exceeded their planned life cycle of 7 to 10 years.

A cross-directorate team of GPS experts and contractor support personnel wrote and reviewed requirements for the new receivers. The resulting contract included design verification, integration and testing and deployment phases.



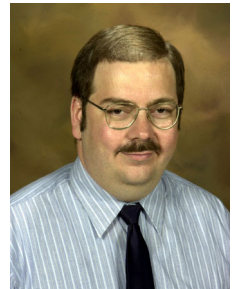
Courtesy of Applied Research Labs, University of Texas at Austin

The accuracy of the Global Positioning System depends on data NIMA provides to the Department of Defense on the orbit of each satellite in the constellation.

Contract completion will be realized when the receivers are successfully deployed to all sites worldwide in 2005. At that time, NIMA will be poised to interface with the Air Force using SAASM technology as the Air Force also implements this capability.

About the Author

A contracting officer representative, Charles Barrett was the program manager for geodesy and geophysics contracts in the Geospatial-Intelligence Technical Services Directorate (GT). Currently he manages hardware and software operations and maintenance for the Integrated Exploitation Capability (IEC), NIMA's first acquisition of a large information system that relies on current and emerging commercial off-the-shelf (COTS) technology. Barrett began his employment with the Defense Mapping Agency in 1989.



GPS Depends on NIMA

The Global Positioning System would not function without NIMA. Agency personnel calculate the precise location of the satellites in the GPS constellation, acting as quality control to the Air Force GPS tracking station network. In providing this orbital data, NIMA establishes Department of Defense truth for GPS, as the Agency and predecessor Defense Mapping Agency have since the first satellite was launched in 1978. With its 24 satellites in orbit 11,000 nautical miles high, GPS is the only system able to show users their exact position on Earth anytime, in any weather, anywhere. Whether supporting the accuracy of DoD smart weapons or safety of navigation for civilian customers, NIMA makes these applications happen, including new uses yet to be discovered.

NextView Will Provide the Vision and Solutions For New U.S. Policy on Commercial Imagery

By Rick Akers

The Intelligence Community has been using space-based commercial imagery for decades. Early multispectral capabilities were useful for agricultural economic analyses, yielding accurate harvest estimates in denied areas. The resulting broad-area crop assessments would have been impractical by other means and were key inputs in the development of long-term strategies during the Cold War.

Later, commercial imagery-based maps were developed as interim, quick-response products for regions where little or no geospatial information existed. This was particularly the case in Sub-Saharan Africa and the Andean region of South America. With changes in policy and the advent of high-resolution commercial imagery, image-based geospatial products have become a staple in military, national and civilian planning and operations.

Beyond Filling Niches

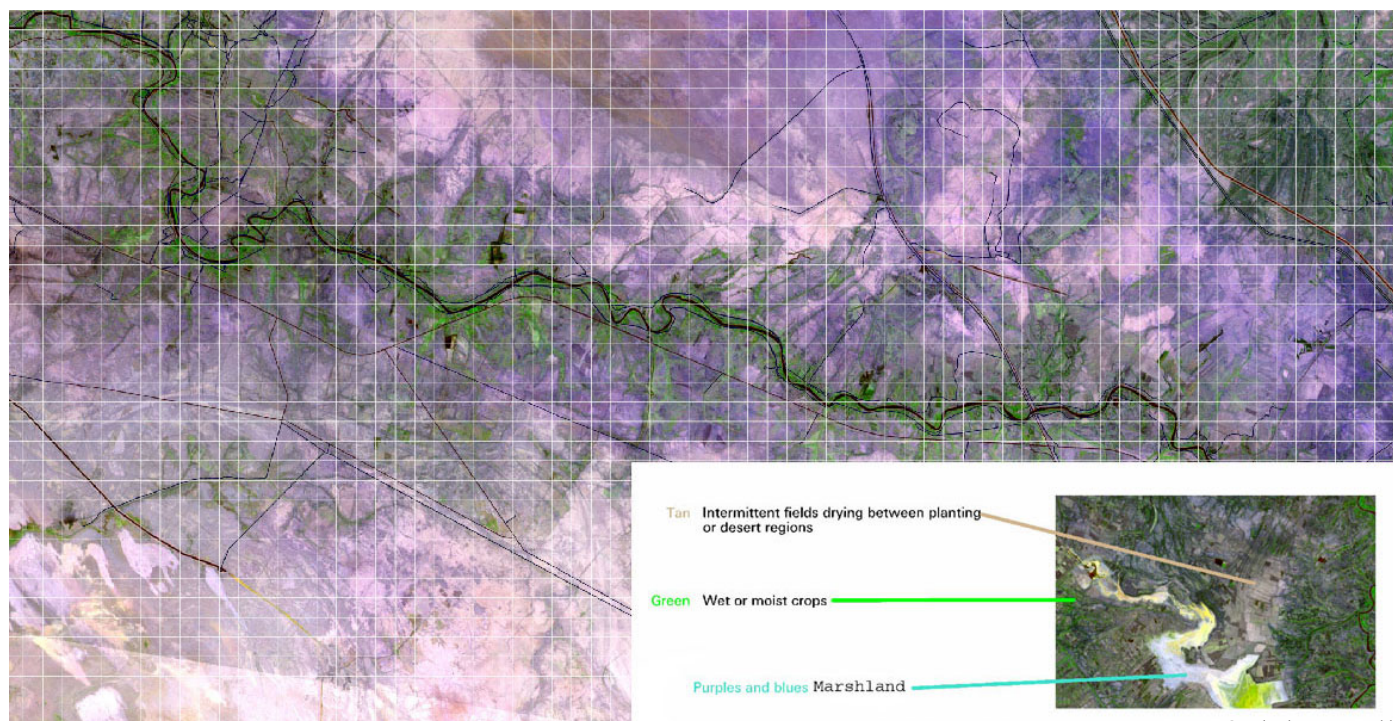
Most recently, Operation Iraqi Freedom has seen commercial imagery go beyond filling niches within the Agency's overall use of imagery to having a status as another, reliable and robust collector for satisfying imagery needs. The combatant command, allies and Intelligence Community used commercial imagery for a variety of planning and operational purposes in a federated environment.

In addition to providing unclassified imagery to support diplomacy, humanitarian relief and reconstruction efforts, commercial imagery supplemented national sources and provided data not otherwise available. Commercial imagery aided in defining deployment locations for Patriot missile and air defense batteries, assisted in mission

planning for the seizure of Kirkuk in northern Iraq, and helped locate and characterize minefields along the Iraq/Iran border zone. It helped demonstrate that the Baghdad oil fires were not the result of U.S. and allied bombing and also provided context for strike/no-strike decisions on Iraqi industrial sites.

The way NIMA acquires commercial imagery has evolved as well. The majority of the commercial imagery purchased by NIMA is now done through the ClearView contract. The ClearView contract demonstrates a long-term commitment to the industry by guaranteeing a minimum amount of purchases to the providers of high-resolution imagery for three years, with two additional one-year options.

ClearView is a significant improvement over previous purchase arrangements. Cumbersome multi-tier licensing



Graphic by Bryce Wyble

Commercial imagery was a reliable, robust collector for satisfying imagery needs during Operation Iraqi Freedom. In the example above, derived from a graphic produced by a NIMA Support Team in Kuwait, Landsat multi-spectral imagery was used to show soil moisture content for the placement of heavy equipment. The team provided the graphic to the Army's V Corps for operations near An Nasiriyah.

structures have been replaced by a single license allowing NIMA to share imagery with all potential partners (military, intelligence, diplomatic, allied nations and coalition partners, federal civil agencies, law enforcement and first-responders). ClearView also provides more favorable access and priority for the government.

Leveraging the ClearView contract, the NIMA Production and Analysis Directorate and Source Operations and Management Directorate are collaborating to build comprehensive, global, multi-year production programs. ClearView encourages more efficient area collection and in conjunction with multi-year programming, it helps reduce uncertainty in the U.S. commercial remote sensing industry. This aligns well with the direction provided by the Director of Central Intelligence (DCI) in his June 7, 2002, letter to NIMA, where he stated, "... use U.S. commercial space imagery to the greatest extent possible ..." and "... commercial satellite imagery [will] be the primary source of data used for government mapping." What was once a strictly ad hoc tasking and collection process is now closely linked with production and analysis programs and requirements for geospatial intelligence.

Presidential Directive

Additional direction and guidance were finalized on April 25, 2003, when the president issued the National Security Presidential Directive (NSPD) *U.S. Commercial Remote-Sensing Space Policy*. The new policy has as its fundamental goal the advancement and protection of national security and foreign policy interests by maintaining leadership in remote-sensing space activities. It directs the federal government to rely, to the maximum practical extent, on U.S. commercial remote-sensing space capabilities for filling the imagery and geospatial needs of military, intelligence, foreign policy, homeland security and civil users. National Technical Means (NTM) remote-sensing space systems are to focus on meeting needs that cannot be effectively, affordably and reliably satisfied by commercial providers.



Photo by Howard Cohen

NIMA Technical Director Roberta Lenczowski answers reporters' questions during a press conference following release of the U.S. Commercial Remote-Sensing Policy by the White House. Before taking questions, Lenczowski briefed the reporters on NIMA's role in formulating and implementing the policy.

The development of a long-term, sustainable relationship between the federal government and the U.S. commercial remote-sensing space industry will enable the industry to compete successfully as a provider of remote-sensing capabilities for foreign governments and foreign commercial users. Sustaining and enhancing the U.S. commercial remote-sensing industry will foster economic growth, contribute to environmental stewardship, and enable scientific and technological excellence.

Under the NSPD, the DCI and Secretary of Defense are to implement appropriate measures to protect national security and foreign policy interests. Along with NASA and the Departments of Commerce, Interior and State, they are also directed to provide a timely and responsive regulatory environment for licensing the operations and exports of commercial remote-sensing systems. For all national security requirements, the NSPD specifies that NIMA is to serve as the agency of primary responsibility for acquiring and disseminating commercial remote-sensing space products and services. NIMA also has primary responsibility, in consultation with the Secretary of State, for all foreign policy requirements.

NextView

The Community Management Staff (CMS) recognized that in order to implement the DCI's guidance—and the intent of the new presidential directive—additional investment would be required. This foresight led to the establishment of a new funding line that will allow NIMA early participation in the next generation of commercial imaging capabilities.

These additional funds are being applied to a new acquisition initiative: NextView. NextView moves beyond the commodity-based approach of commercial imagery acquisition and seeks to assure access, priority tasking rights, volume (area coverage) and broad licensing terms from the next series of high-resolution U.S. commercial imagery satellites.

NIMA's new Commercial Imagery Program Manager, Sandy Jacks, is conducting the NextView acquisition in two phases.

In Phase I—a Request for Information (RFI)—NIMA solicited industry input at a bidders conference March 21. Noting the importance of proceeding with the conference in the middle of a war, NIMA Director retired Air Force Lt. Gen. James R. Clapper Jr., in opening remarks, cited the huge demands for geospatial intelligence. There is "no way the NTM constellation can meet these

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Innovations Earn E-Gov Awards

NIMA was among 50 government agencies honored for their innovations in E-Government during the E-Gov 2003 Conference and Exposition held recently at the new Washington Convention Center in Washington, D.C.

The agency's Human Capital Management Program was honored under the Pioneer category, while the E-Commerce program garnered an award under the Explorer category. The awards, sponsored by Accenture, recognize solutions for improving electronic government

delivery and exemplary achievements in E-Government and higher education service delivery.

For the Pioneer award, NIMA's PeopleSoft program demonstrated best practices through its technical implementation of NIMA's Human Capital Management system. "The key to our success was the deployment of self-service capabilities through a web-based employee portal," a spokesperson said.

Supplying customers with a means of getting geospatial intelligence from a

central location was part of the impetus for NIMA receiving an Explorer award. The National Technology Alliance (NTA) spearheaded a project that ties together the elements that will allow users to easily discover, download and order NIMA's products online. NIMA is the executive agent for NTA and the resulting initiative, which proved efficient, helped customers get products quicker, and saved American taxpayers about \$500,000.

—Muridith Winder

New Policy on Commercial Imagery

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demands on its own," he said. "NIMA is seeking imaging capacity, a synchronized admixture of both NTM and commercial."

Clapper said NIMA is looking for innovative and creative ideas from, and partnerships with, the U.S. commercial remote-sensing industry. Continuing the theme, contracting officers encouraged teaming among companies with complementary strengths to meet the required and desired capabilities.

NextView is not just an extension of the ClearView contract, said NIMA Technical Director Roberta Lenczowski in closing remarks. "The RFI outlines an end-to-end approach; we want industry to take a holistic view, looking at all aspects of tasking, posting and processing." Phase I provides "an opportunity for those in this community to talk about how you take this holistic view." Noting that "NIMA is not buying or building a satellite—we buy and use imagery," Lenczowski said, "We want optimal solutions for our needs. We are talking about capabilities and capacity that are beyond what is currently available."

What's Next

Phase II began with the recent release of a Request for Proposals (RFP).

NextView is not only about imaging capacity; it's also about fostering a closer partnership with the commercial imagery industry and integrating commercial and national imagery into a common "acquisitional" picture that facilitates asset management and requirements fulfillment.

Between now and the time NextView capabilities are expected to be fully realized (fiscal 2006), expect to hear more about accomplishments in integrating commercial imagery into the archiving and dissemination portions of the NIMA System for Geospatial Intelligence (NSGI). NIMA's GeoScout contract is the principal vehicle for delivering transformed NIMA mission and corporate capabilities. This innovative contract will take on the responsibility of defining, designing and integrating the infrastructure and data standards to make commercial imagery an integral part of the NSGI.



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NIMA provided this Ikonos satellite image of an area southwest of An Najaf to the 320th Engineer Battalion to plan the location of an Unmanned Aerial Vehicle launch and retrieval facility. It was used to supplement NIMA Controlled Image Base® of the area. Besides military and intelligence planning and operations, commercial imagery supports diplomacy, humanitarian relief and reconstruction efforts.

About the Author

Rick Akers is the Senior Executive Officer for the NIMA Technical Executive. Over the last 19 years, he has had a variety of duties at NIMA and predecessor

agencies. These include precision targeting, overseas assignments managing co-production and airborne collection, imaging science and replication, leadership and management positions in production and analysis, command liaison and, most recently, assignment at NIMA's Central Imagery Tasking Office, now the Source Operations and Management Directorate.



Thailand Re-Mapped in Unparalleled Cooperative Effort

By John Doty

NIMA is working with its counterpart in Thailand to re-map that entire country. The effort is without precedent in modern mapping—approached in scope only by wartime initiatives.

Thailand's King Bhumipol Adulyadej Maharaj used maps while visiting flood-ravaged areas in 1995. In what is now legend in the Thai mapping community, he commented to an aide that the map in his hand looked nothing like the scene before him (changes from the flooding aside). The legend is bolstered by the king's well-known love of maps. His daughter, Princess Maha Chakri Sirindhorn, studied remote sensing and is a patron of the national mapping organization, the Royal Thai Survey Department (RTSD).

As the words of presidents, kings and prime ministers will, those simple comments led to a major effort, in this case to bring the national collection of topographic line maps (TLMs) quickly up-to-date. (Most Thai maps dated back to the Vietnam War era.) The magnitude of the effort—800-plus 1 to 50,000-scale TLM sheets—was more than RTSD could reasonably undertake. At the time, the Defense Mapping Agency (DMA), which preceded NIMA, could not take on such a project in an area that U.S. military commands did not consider their highest priority. DMA leaders were, however, developing the idea of private companies doing large amounts of production work under contract.

After lengthy, involved and often tense discussion and negotiation, NIMA (emerging in 1996) and RTSD agreed on a plan involving private U.S. companies. It called for NIMA to administer contracts under which the companies would produce various digital and paper products. NIMA and RTSD also agreed on a limited amount of in-house co-production, but contract production (total cost to Thailand: \$30 million) remained the core feature of the joint effort.

Production Process

In support of what came to be called the L7018 Recompilation Project, RTSD survey planes collected conventional 9-inch-by-9-inch (black and white) imagery of nearly the entire country, with sufficient overlap to allow stereo modeling. RTSD personnel classified the land, creating Field Classification Overlays (FCOs) based on direct field observations. Names specialists prepared name cards corresponding to features shown on the FCOs, while the Interior Ministry contributed definitive feature names, administrative boundaries and local government status. Cartographers annotated prior editions of the maps (Series L7017) with known changes and administrative staff built source packages, bringing together the relevant sources.

To achieve map contours, NIMA and contractors collected detailed elevation information in the form of Digital Terrain Elevation Data (DTED®) at roughly 30-meter intervals, so-called

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More than 800 maps covering all of Thailand are being produced in a project initiated by the Royal Thai Survey Department that also involves NIMA and private U.S. companies. The size of California and Virginia combined, Thailand stretches 1,200 miles from north to south, covering an area of 198,455 square miles.



Photos by Wayne Nelson

The head of a Buddha figure, preserved in a banyan tree, gets the attention of a NIMA family member. The head is believed to be among those severed from statues centuries ago at the ancient capital of Ayutthaya by Burmese invaders. The capital's spelling is yet another variation of the name in the Thai language, which has some 45 consonants and 30 vowels. See "Note on Thai Language."



Royal Thai Survey Department

The Royal Thai Survey Department (RTSD) is a joint-service military organization with many functions similar to NIMA's, including a survey school, large printing operation and imagery function. The printing division functions as the central printing office for the Thai Supreme Command (equivalent of Pentagon/Joint Chiefs of Staff), printing books, leaflets, brochures and instructional materials in addition to its large-scale map and chart operation. Its five-color printer is in roughly the same configuration as the most modern printers at NIMA's facility in Arnold, Mo. The RTSD air wing collects conventional 9-inch-by-9-inch photography of Thailand for use by various government organizations and, in some cases, sale to the public. The RTSD Map Information Center develops and distributes specialized digital and paper maps in support of senior government officials.

While it may collect map information about other countries, RTSD's current production responsibilities center on mapping the nation for government and public customers. RTSD is a major player in negotiation and demarcation of international boundaries, participating in all border commission meetings and employing many of its surveyors in demarcation activities to establish well-defined borders.

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Level 2. NIMA then produced two 1-degree cells and the contractors the remaining 74.

From the new aerial imagery, NIMA and contractors extracted map features into a digital database in which each feature is represented by vector data (points, lines or polygons). These cultural features included lines of communication (for example, roads), city outlines, vegetation and other land-uses. Delineation of the features required a lengthy attribution process.

Preparation of names data in both English and Thai script was a key transition between extraction and finishing. Geographic names specialists transliterated most Thai terms and place names to English subject to final review by the RTSD. In the finishing stage, cartographers prepared the final product in accordance with specifications regarding the portrayal of each feature—its symbol, use of lines or fill, color and labeling.

The deliverables include press negatives (to mass-produce lithographs), color proofs (to check print quality), and softcopy to support modern production and maintenance. Digital reprostat will allow NIMA and RTSD to exchange reproduction material without having to create film negatives, saving the associated cost.

Personal attention to quality by NIMA reviewers was and remains critical to the success of the project. Highly experienced NIMA teams made periodic trips to contractor sites and performed numerous in-house reviews of interim products, in-process extraction and finishing reviews, and final product inspections. Previously the contractors had worked more on a piece-meal basis, producing small amounts of products to augment overall capacity. The Thailand project reflected the first substantive efforts by the private companies to produce at the pace and complexity of output that is standard for NIMA. A cast of contracting officers, contracting officer representatives, quality reviewers and production managers led the NIMA effort to bring contractors to the desired level of production.

One private company manager, when asked, "If you were to do this project over ..." stopped the questioner with the unusually honest response, "The question is really whether we would (take on the project) and the answer is 'probably not.'" In the early days of the project most of the companies lost money, expending more effort to gather resources, meet production schedules, and match NIMA quality standards than could be recouped in the contract.

In the last year, contractor companies have settled into the production rhythm that is typical of NIMA daily life and found efficiencies that could make the project reasonable, even profitable. Having achieved that rhythm, the companies now represent an industrial base capable of making a significant contribution to the U.S. national mapping capability at reasonable cost while recouping the reasonable profit required in doing business. At the same time, NIMA and other mapping organizations like RTSD have gained a source for military mapping products with the capability to meet rigorous standards in both quality and schedule.

Conclusion

The case of recompiling Thai national mapping in short order was and is special. It involved a combination of factors including a monarch's special vision for what a map should be, a nation's commitment to pay substantially for such work, the emergence of commercial mapping capabilities and a national agency prepared to commit itself to a massive organizational effort.

The NIMA project manager monitored the schedules, reports and outcomes of production processes from no less than 15 production entities (contractors, sub-contractors, NIMA production and printing units and the RTSD) for output of four different final product types (and many deliverables) spread among those units.

The two major contractors (working with their various sub-contractors) are producing at a rate now that could result

in completion of the project well before the programmed completion date (delivery of all the products, data, and production materials to Thailand by Dec. 31).

On delivery, the Royal Thai Government will have perhaps the most current and detailed national mapping collection in the world. Few nations can claim this kind of information on their own country, especially with the quality standards, uniformity of production sources and currency achieved in the effort. At the same time, NIMA will have delivered—not without substantial cost (estimated at \$16.5 million) and effort—a huge product set primarily from commercial sources.

About the Author

John Doty returns in July from three years in Thailand as the NIMA Regional Officer for South Asia and site coordinator for the L7018 Recompilation Project. "During my tour, I have seen substantial expansion in the role NIMA plays in exercises. Exercise Cobra Gold is one of the largest bilateral-multilateral military exercises worldwide," Doty reports. "I have also seen excellent geospatial intelligence support to counter-drug activities (through assistance to embassy partners) and advancement of World Geodetic System 84 as the basis for air traffic and safety systems in the region." Doty served in the United Kingdom from 1987-91 as liaison officer to British military mapping organizations. In 1996 he proposed the first public release of a product derived from Digital Terrain Elevation Data (DTED®) to support aviation safety, later announced during a White House conference.

Note on Thai Language

Thai language is, first, a spoken language. Any given syllable or sound may have as many as five meanings, according to the tone applied to it. Each syllable/tone combination corresponds to a different consonant (approximately 45) or vowel (approximately 30) in the Thai alphabet. When transliterated into English, the spellings of Thai words are often imprecise. For example, road signs to the ancient capital may feature several different spellings (Ayuttaya, Ayudya, Ayudhya or others) according to phonetic rules applied by different governmental units. Having multiple spellings for the same feature on military maps is, however, a cardinal error. Thai-speaking names specialists consult references like the Royal Institute or apply established rules for sounding out names—attempting to be as disciplined and consistent as possible.

The prevalence of Westernized names (and resistance to them) is also a factor. The word Bangkok, for example, is a fairly crude name for the capital of Thailand compared to its correct name in the Thai language: Krung Thep Maha Nakhon (literally, City of Angels). Decision makers are forced to choose between the common, if somewhat unflattering, word and the more noble, but less recognized, official name. Transliteration of names occurs at a fairly critical point in the L7018 production process (after extraction but before finishing). Thanks to the Internet, names are transmitted back and forth between Thailand and the United States expeditiously.



In Yasothon, a city in Thailand's far northeast, a concert is part of the festivities at the Boon Bang Fai (Rocket Festival). Royal Thai Survey Department personnel visited nearly every square meter of Thailand to verify information shown in newly collected aerial photos, such as road category and vegetation type.

Photo by Wayne Nelson

Career Development Centers Go to College

NIMA's Career Development Centers are now Leadership Development Centers (LDCs), part of the National Geospatial Intelligence College (NGC). The change benefits both managers and the work force, says Dave Broadhurst, Director of the Training and Doctrine Directorate (TD).

Although the locations of the three centers—Washington, D.C., St. Louis and Bethesda, Md.—have

not changed, their principal mission has expanded beyond career development, Broadhurst noted. It now includes leadership research, mentoring, coaching, organizational consulting and assessment interpretation. There is also a state-of-the-art leadership, managerial and supervisory lending library.

The centers have moved organizationally, from the Human Resources Directorate to TD and

the College's School of Leadership and Professional Studies (SLPS). LDCs will be part of an integrated leadership program that will help develop and foster a leadership culture at NIMA, said SLPS Dean Fran Early.

The centers will continue to provide support in all areas of career development (including networking, job search, resume guidance and interviewing skills),

as well as self-development. At the same time, they will be "instrumental in transforming both the NIMA work force and culture to better respond to future challenges," Early said.

—Donald Patterson



Geospatial Intelligence in World War I Map in Smithsonian Exhibit Inspires Respect

A map used by Gen. John J. Pershing, commander of the American Expeditionary Forces during World War I, is the subject of an article in *Smithsonian Magazine*. In 1919 Pershing donated a reconstruction of the map to the Smithsonian Institution; currently, it is part of the exhibit "West Point in the Making of America" at the National Museum of American History.

The exhibit examines the lives of West Point graduates—engineers and explorers, business and military leaders—who influenced the building of the United States. NIMA loaned artifacts from its historical collection to the exhibit: the traveling desk of Col. John James Abert to illustrate his role in the history of topography, and his wife's traveling makeup case to illustrate the role of an Army wife.

Pershing kept the 9-foot-by-10-foot top-secret map locked in a cubicle in his war room in Chaumont, France, which has been re-created for the exhibit.

The map "forever captures America's triumph on the Western Front," Victoria Dawson writes in the March issue. Visitors see graphically—at the exact hour of the armistice—the position of Allied and German troops along the 450-mile Western Front that stretched from the Belgian coast to the Swiss border with France.

According to Dawson, "Pershing's map, for the first time ever, provided a systematic way of gathering and translating intelligence into one central battlefield picture. Allied officers who saw the map declared it the most accurate representation of the opposing forces they had ever seen."

Describing the map, she writes, "A tight and meandering column of red hat pins delineates the front line. From there, rows of pins fan out laterally like leafless branches to mark the boundaries between the corps of the Allied

and German armies. Thumbtacks, many hugging the front line, are color-coded to show each division's condition—white for tired, blue for fresh. Each tack holds down a colored

paper tag printed with the division's number. On the Allied side of the front, solid red tags mark the American divisions, while on the enemy's side a tag's color relays a division's fighting reputation."



Gen John J. Pershing

Library of Congress Prints and Photographs Division

Dawson quotes Brig. Gen. John S. Brown of the U.S. Army Center of Military History, who calls the map "a brilliant innovation, an absolute conceptual leap forward."

Time has not diminished the map's capacity "to inspire respect," Dawson notes.

When visitors first saw the map in 1919, the effect was "galvanizing," Brown says. "For 200 years the Europeans viewed us as incapable of competing. They were disparaging of our military and organizational abilities. Then, in a brief time—just a year—we went from noncombatant to victor. The map evoked it all."

"West Point in the Making of America" is on view at the National Museum of American History until January 2004. For more exhibition information, visit www.americanhistory.si.edu/westpoint.

—Paul Hurlburt

Geospatial Intelligence & Information for the Nation

The Foundation for Security – A Symposium

NIMA Seniors will participate in the first annual industry-sponsored Geospatial Intelligence Symposium.

NIMA leaders discuss the future of Geospatial Intelligence and how the agency will transform over the next 10 years to meet evolving intelligence requirements

SYMPOSIUM HIGHLIGHTS:

- Meet with industry leaders responsible for programs, systems, organizations and initiatives that are transforming military strategy and national policy
- Hear National leaders discuss their views on homeland security issues, including:
 - Lt. Gen. James R. Clapper, Jr., USAF (Ret.)
 - Honorable Joan Dempsey
 - Lt. Gen Edward Anderson
 - Senator Robert Kerrey
 - Bran Ferren
- Visit 50 technology displays from the industry's foremost suppliers of geospatial systems and services
- Network with attendees from both government and industry – many of whom were on the front lines bringing freedom to others who are on the frontline on the homefront protecting our nation today

The goal of this symposium is to create an environment of cooperation and openness between government, military and the private sector. It is also intended to encourage the development and advancement of the Geospatial Intelligence tradecraft.

For more information go to www.geointel.org

NIMA's INNOVISION DIRECTORATE

is soliciting concepts and technologies for Geospatial Intelligence research and development initiatives. InnoVision intends to announce the winning proposals at the Geo•Intel 2003 Symposium. Details will be posted soon on the conference website: geointel.org.

Commercial Imagery Samples

EO-1 HYPERION :: HYPERSPECTRAL COLOR COMPOSITE

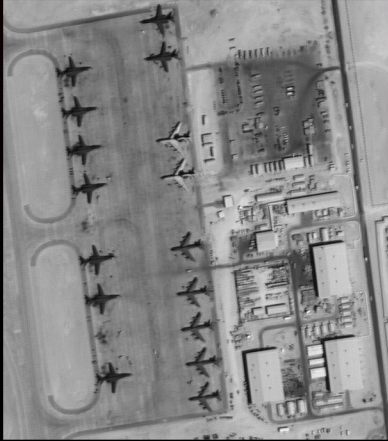
Goldfield/Cuprite, NV
U.S. Geological Survey



EROS A :: HYPERSAMPLED, SUB-METER PANCHROME

Thumrait Air Base, Oman

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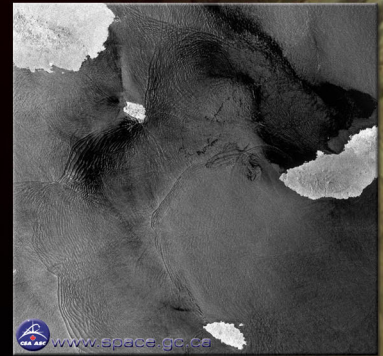
RADARSAT 1 :: STANDARD BEAM

Galapagos Islands Oil Spill

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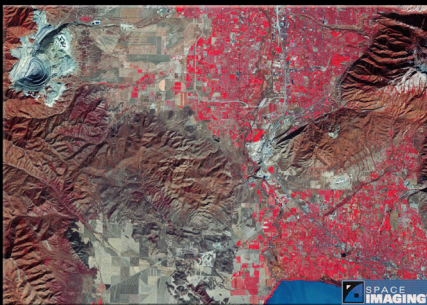
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LANDSAT -7 :: 15-METER FALSE COLOR INFRARED COMPOSITE

Provo, UT

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IKONOS :: 1-METER NATURAL COLOR COMPOSITE

Itaipu Dam, Brazil/Paraguay border

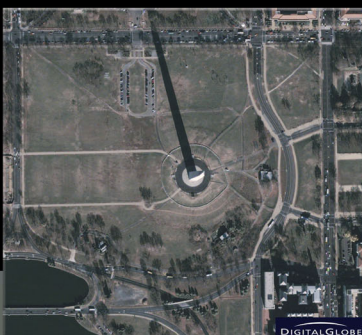
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QUICKBIRD :: .61-METER PAN SHARPENED NATURAL COLOR COMPOSITE

National Mall, Washington Monument

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